Athens, Clarke county, Georgia: a severe storm passed through this vicinity from southeast to northwest on the 18th; it caused considerable damage to buildings and crops.

Milwaukee, Wisconsin: a thunder-storm, accompanied by very heavy rain, prevailed from 6.40 to 8.25 p. m. on the 19th; no damage was done in this vicinity, but to the northward of station the storm was very severe. A maximum wind velocity of thirty-six miles from the northwest occurred at 7.30 p. m.

New Britain, Hartford county, Connecticut: a storm of unusual severity occurred at 4 p. m. on the 21st. In the upper part of the town about one hundred trees were blown down.

Archer, Alachua county, Florida: a severe storm, blowing down buildings, trees, etc., occurred here at 3.30 p. m. on the 21st.

Muncie, Delaware county, Indiana: a severe storm of wind and rain passed through the southeastern part of this county during the evening of the 22d. The growing crops were seriously injured and out-buildings, fences, etc., were blown down.

Columbus, Ohio: a severe storm passed over this city from northwest to southwest during the afternoon of the 22d. Although the velocity of the wind in the city did not exceed twenty miles per hour, at points two miles distant the storm assumed the character of a tornado, uprooting trees, etc.

Richardton, Stark county, Dakota: at 4 p. m. on the 23d a violent storm of wind and hail completely destroyed the crops over a strip of country six miles in length, south of Richardton.

Omaha, Nebraska: a very severe thunder-storm moving from southeast to northwest, occurred at this station between 1.43 and 2.10 a. m. on the 25th. The rainfall was remarkably heavy and caused considerable damage.

Lancaster, Pennsylvania: the storm on the night of the 26–27th, was very severe in this vicinity. The corn and tobacco fields were badly washed, entailing a heavy loss.

Moorhead, Minnesota: reports from the surrounding country state that the crops were badly damaged by a severe storm on the morning of the 28th. Threatening clouds were observed to the northwest of station, but no storm occurred at this place. A violent thunder-storm from the northwest occurred at about 7 a. m. on the 29th; from 7.45 to 7.50 a. m. the wind blew at the rate of sixty miles per hour. This latter storm is considered one of the severest ever experienced here, and caused much damage in the city and vicinity. Buildings were unroofed, trees uprooted, and crops in the surrounding country were badly damaged. Much damage was done by lightning both at Moorhead and Fargo, Dakota.

Doylestown, Bucks county, Pennsylvania: shortly after 4 p. m. on the 29th a tornado passed over the western part of Hilltown, in this county, causing the destruction of buildings, fences, etc.

Dubuque, Iowa: a severe storm, accompanied by heavy rain, occurred here during the evening of the 29th, causing much damage to buildings in course of erection.

Louisville, Kentucky: from 4.30 to 8.32 p. m. on the 30th a thunder-storm, accompanied by very heavy rain, prevailed. For ten minutes the wind blew at the rate of thirty-six miles per hour. Small hail fell from 5.02 to 5.07. The temperature fell from 96°.8 to 73°.

The following are reports received from the special tornado observers of the Signal Service, of whom there are more than 1,400:

Strafford, Strafford county, Kansas: a tornado occurred here at 3 p. m., on the 1st. The cloud was funnel-shaped and moved in a northeasterly direction for a distance of three miles, its path being from one hundred to two hundred feet wide. Heavy rain and thunder occurred before and after the passage of the tornado-cloud. A dwelling and barn were destroyed. The shortest time in passing a given point was one minute.

Lind, Waupaca county, Wisconsin: a tornado occurred here at 8 p. m., on the 8th. It was accompanied by an unusual electrical display. Thirty buildings were unroofed or destroyed.

Madison, Wisconsin: a tornado occurred here at 9 p. m., on the 8th. The cloud was balloon-shaped and moved in a direction from northwest to southeast, its path being about one-half mile in width. One building was destroyed and several were unroofed. The damage is estimated at $40,000.

Monticello, Wright county, Minnesota: a tornado occurred five miles north of this place at 3.25 p. m. on the 8th. The cloud was funnel-shaped and moved in a direction E. 20° N. for a distance of three miles, and then disappeared. The diameter of the tornado-cloud is reported to have been about fifteen feet, and the direction of the whirl was contrary to the movement of the hands of a watch. One dwelling and an out-building were destroyed.

Oshkosh, Winnebago county, Wisconsin: a tornado occurred twelve miles west of this place at 8 p. m. on the 8th. No damage was reported.

Winona, Winona county, Minnesota: at 5 p. m. on the 8th a tornado-cloud was observed at this place; it did not touch the ground, and disappeared when near the city. A severe storm of wind and rain, accompanied by a brilliant electrical display, followed.

Allegan, Allegan county, Michigan: a tornado occurred here at 11.40 p. m. on the 8th. The tornado cloud moved from southwest to northeast in a path two hundred feet wide. A large barn was destroyed, two others were unroofed, and many trees, fences, etc., were demolished. The damage is estimated at $10,000.

Kent's Hill, Kennebec county, Maine: a tornado occurred at this place at 4.05 p. m. on the 9th, its path being about eight miles in length. It caused much damage to barns, trees, etc.

West Brookfield, Worcester county, Massachusetts: a tornado occurred here at 4.35 p. m. on the 9th. The cloud was funnel-shaped and moved from southwest to northeast. But little damage was done.

North Springfield, Green county, Missouri: a tornado occurred here at 4 p. m. on the 10th. The cloud was funnel shaped and moved in a southeasterly direction. No damage resulted.

Harold, Hughes county, Dakota: a tornado passed through the villages of Highmore and Holabird, in Hyde county, on the afternoon of the 15th. It started about ten miles north of Harold and then passed through the places above named. The tornado-cloud was funnel-shaped, and moved in a southeasterly direction until reaching Highmore, where its course changed to the eastward. At one time there were eight funnel-shaped clouds visible; all but two of these had disappeared when the storm struck Highmore. Fifteen dwellings and a church were destroyed, and two persons were killed. Damage estimated at $40,000 was done at Highmore; damage to the extent of $15,000 was also done at other points in Hyde county.

Upland, Jewell county, Kansas: a tornado occurred here at 5 p. m. on the 26th. At one time there were observed to depend from the front of the storm cloud twenty funnel-shaped clouds; these were constantly varying in form and position. The electrical display was intense in the surrounding clouds, but no electricity was observed in the funnel clouds. The progressive velocity of the storm was estimated at forty miles per hour. No damage resulted, as the storm occurred in an open plain.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the Arkansas, Mississippi, and Missouri rivers the highest stages at all stations, with one exception, viz., La Crosse, Wisconsin, on the Mississippi, occurred between the 1st and 10th; and the lowest stages during the latter half of the month.

In the Ohio river, at Pittsburg, Pennsylvania, navigation was suspended on account of low water on the 5th; and Professor Bœrner, at Vevay, Indiana, reports that the river opposite that place reached a stage so low, on the 19th, as to render navigation dangerous.

Navigation in the Cumberland, at Nashville, was suspended on account of low water on the 25th.

The Arkansas river, at Fort Smith, rose rapidly on the 5th, 6th, and 7th, and on the last-named date it reached its highest stage, having risen 10.7 feet since the 4th; after the 7th it fell slowly.

In the following table are shown the danger-points at the various river stations; the highest and lowest stages for July, 1885, with dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, July, 1885.

[Expressed in feet and tenths.]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red river:						
Shreveport, Louisiana	29 9	14	22 5	31	15 7	6 8
Arkansas river:						
Fort Smith, Arkansas	22 0	7	20 9	31	6 2	14 7
Little Rock, Arkansas	23 0	10	20 4	31	8 0	12 4
Missouri river:						
Yankton, Dakota	24 0	6, 7, 8	19 2	30, 31	17 8	1 4
Omaha, Nebraska	18 0	7, 8	13 4	31	10 6	2 8
Leavenworth, Kansas	20 0	8, 9	15 8	22	13 1	2 7
Mississippi river:						
Saint Paul, Minnesota	14 5	1	5 9	17	4 2	1 7
La Crosse, Wisconsin	24 0	30	9 3	21, 22	5 9	3 4
Dubuque, Iowa	16 0	1, 2	8 9	25	6 4	2 5
Davenport, Iowa	15 0	6, 7, 8	6 5	22	4 7	1 8
Keokuk, Iowa	14 0	10	7 2	21, 22, 23	5 2	2 0
Saint Louis, Missouri	32 0	1	22 5	22	16 0	6 5
Cairo, Illinois	40 0	1	26 8	28	15 5	11 3
Memphis, Tennessee	34 0	1	22 0	30	10 4	11 6
Vicksburg, Mississippi	41 0	4, 5	33 7	31	19 6	13 9
New Orleans, Louisiana*	—3 0	7	— 4 5	31	— 8 4	3 9
Ohio river:						
Pittsburg, Pennsylvania	22 0	27	6 0	13	0 6	5 4
Cincinnati, Ohio	50 0	1, 2	10 0	18, 19	4 8	5 2
Louisville, Kentucky	25 0	1	5 9	21, 22	3 2	2 7
Cumberland river:						
Nashville, Tennessee	40 0	3	6 6	26	2 0	4 6
Tennessee river:						
Chattanooga, Tennessee	33 0	1	5 5	21, 25, 26, [27	2 8	2 7
Monongahela river:						
Pittsburg, Pennsylvania	29 0	27	6 0	13	0 6	5 4
Savannah river:						
Augusta, Georgia	32 0	30	7 9	20	5 5	2 4
Mobile river:						
Mobile, Alabama	.....	1	18 3	6	15 0	3 3
Sacramento river:						
Red Bluff, California	.....	1	0 9	18 to 31	0 5	0 4
Sacramento, California	.....	1 to 5	9 0	28 to 31	7 8	1 2
Willamette river:						
Portland, Oregon	.....	1	13 6	31	6 4	7 2
Colorado river:						
Yuma, Arizona	.....	.....	.....	.....	.....	.....

* Below high-water mark of 1874 and 1883.

HIGH TIDES.

New Siver Inlet, North Carolina, 16th, 17th.
Cedar Keys, Florida, 12th, 13th, 14th.

LOW TIDES.

Indianola, Texas, 20th, 28th.

FLOODS.

Parsons, Labette county, Kansas: during the night of the 1–2d all creeks and ravines in this region were much swollen. The washing away of bridges caused an almost entire suspension of railroad traffic. The Labette lowlands were submerged, compelling the people to abandon their homes. Considerable damage was done to crops, especially to small grain which was nearly ready for harvest.

Neosha Falls, Woodson county, Kansas: nearly all of the eastern part of the town was inundated on the 3d. In the lowlands in this vicinity the crops were entirely destroyed and much stock drowned. All residents in the northern part of the town were compelled to move.

Humboldt, Allen county, Kansas: on the 3d the Neosha river at this place rose three feet higher than ever before known. No trains arrived at Humboldt on the above date.

"The Argus," of July 4, 1885, published at Albany, New York, contained the following:

QUEBEC, PROVINCE OF QUEBEC, *July* 3.—Recent heavy rains have caused considerable damage to dams and booms on the rivers around Quebec, which will retard lumber sawyers considerably. In addition to this, a large number of logs have been lost. This summer's floods have been the most serious for years.

Fort Collins, Larimer county, Colorado: the heaviest rain of the season fell on the afternoon of the 9th. The lowlands in this vicinity were flooded, causing considerable damage to the hay crop. A washout occurred on the railroad about one and one-half miles from this place.

Reports from Titusville, Crawford county, Pennsylvania, state that at about 3 p. m. on the afternoon of the 13th a "cloud-burst" occurred on the hills to the south of that place. It is stated that the water rushed down the hills in vast sheets, carrying away barns, fences and bridges, and washing up large trees. A second 'cloud-burst" is also reported as having occurred later on the same day.

Bangor, Maine: on the 2d the Penobscot river reached the highest stage known for many years at this season.

Rio Grande City, Texas: the Rio Grande river began to rise at 6 p. m. on the 1st; during the following night it rose rapidly and overflowed, inundating the lowlands south of the city. The damage caused by this overflow was slight, as the crops in the submerged area were destroyed by the floods which occurred in May. The river fell rapidly on the 3d.

Lamar, Missouri: the very heavy rains of the 3d and 4th caused the streams in this vicinity to overflow, resulting in the washing away of many bridges and culverts. Trains on all railroads in this part of the state were delayed.

Denver, Colorado: during the afternoon of the 26th a "cloud-burst" occurred at a place known as the "Divide," about forty miles south of here. It caused a destructive freshet in Cherry creek, which runs through Denver. At 5.30 p. m. the creek, as is usual at this season, was entirely dry, but at 6 p. m. it was so swollen as to overflow, causing great damage to property. Numerous bridges and a number of houses along the banks of the creek were washed away. This freshet was the most destructive that has occurred here since 1878.

Concerning a remarkable "cloud-burst" which occurred in Colorado during the evening of the 25th, and which proved so destructive at Colorado Springs, the following information has been obtained through "The Daily Gazette," published at that place:

During the evening unusually dark and threatening clouds gathered around the city; from 7 p. m. until midnight heavy showers of rain occurred at intervals, and at times the clouds were brilliantly illuminated by continuous lightning. The wind blew with considerable force, and seemed to come from all quarters. Shortly before 10 p. m. the flood reached Colorado Springs, washing away a dwelling and some out-buildings. The water rushed upon the northern part of the town with such suddenness that the two occupants of the dwelling which was washed away had not time to escape before the building was swept from its foundation.

The following remarks, by Professor Strieby, concerning the "cloud-burst" are also from "The Daily Gazette," before referred to:

It is now possible to trace the course of the devastating flood of Saturday night from its small beginning on the Merriam ranch, through Templeton's Gap, across the long even slopes north of town and through the city. The line of its passage is marked by heaps of rubbish, banks of sand, round cannon-ball shaped masses and wreckage of fences.

The conditions of rapid and extensive precipitation were all present in this storm. The warm moisture-laden air of the day encountered the chill blasts of the upper strata and torrents of rain, accompanied by incredible quantities of hail, were precipitated upon every thing beneath.

The area covered by the storm was probably quite extensive, but that portion of it to which Colorado Springs is indebted for its visitation is comparatively limited.

The old Merriam ranch, east of Templeton's Gap, is a large basin-like depression of some two thousand or more acres content, the natural drainage of which is through the gap. Within this space the rainfall was evidently remarkable, and unmelted hail was still to be seen there up to Monday evening. The contour of that whole area is such as to offer no rapid escape for the accumulating waters. The deep layer of hail and the stiff wiry grass long held in check the increasing volume of waters until they burst their bonds, and then from all points of the inclosure the swelling streams began to make their way to the natural outlet. As brook was added to brook and creek to creek the turbid waters approached the focal point near the herders' huts and became a mighty river ever increasing in volume by the streams from every rocky hillside and cañon.

This muddy, icy river rushed through Templeton's Gap with a violence that tore its banks, uprooted trees, and levelled obstructing fences. It may be of interest to note the volume of water which deluged our city. Just after the stream emerged from the gap, at a point favorable for measurement, the banks

being steep on both sides and the bottom nearly level, its width, as shown by the lines of debris on the slopes, was about one hundred and seventy-five feet and for the greater part of that distance the depth was approximately seven feet. This gives a section of over a thousand square feet, and the velocity of its discharge must have been frightful over the steep incline of its bed. To the immense volume now in motion there was added all the mass of rain and hail that fell on the area this side of the gap.

In its course through the gap the flood tore large masses of the tenacious black clay from the banks, and the current, with resistless power, propelled them down the stream, turning them over and over, abrading the edges at every bound, until they were converted into balls and cylinders, and these nodules rolling in the gravel gained a rough, stony coating making them seem like rock-hewn cannon shot. In many places above the town these curious masses, ranging in size from a barrel to an apple, gave to the ground the look of an old battle field strewn with shot. These clay nodules when imbedded in sand and hardened by lapse of time have in other places caused great speculation, and brought out many deep theories respecting their origin. An opportunity is here offered to our people to catch nature in the act of storing them in the newest strata.

Passing out of the gap the angry current entered the Roberts ranch and soon after, encountering rising ground, was divided; one portion, and that by far the larger one, passed on in the direction of the ranch house, threatening to sweep it from its foundations, but soon it was again divided, and only a part approached the house. The house occupied higher ground and was left untouched, but the owner remarked, with feeling, that he wished his corrals and garden had been put higher up too. This main stream made a sharp bend below the Roberts house, and now turned southwestward and began to spread out over the flat surface until, when near the city limits, it reached to within a block of Cascade avenue. No water from Templeton's Gap passed westward as far as this avenue. A slight ridge, almost imperceptible to the casual observer, runs from a point a short distance west of Colonel Ensign's house to the fair ground west of the windmill, and owing to the diversion of the waters by this rise Tejon street and Nevada avenue escaped the impending danger.

The stream which branched off at the ranch house made its way southward and finally joined the main stream we have just followed, north of Colonel Ensign's house. At the eastern edge of the Roberts' ranch where the stream first divided, vast numbers of the clay nodules were left stranded in the slack water. We have now to follow this first separated portion of the divided river. It passed in a southwestward direction close to the road leading to Templeton's Gap, and spreading out became nearly a thousand feet wide a little way above the city limits. Again rising ground caused the waters to part; a large portion passing to the south and east, entered Shook's run, where it is crossed by the main irrigation ditch, and thus relieved the flooded streets of a vast volume of hail and water; the other branch made its way onward until it joined the main stream just above the Hooper House. Now, all the divided forces of the flood united were gathered for the final onslaught upon the town. The direction of its course was such as to cause its central current to pass close to the Hooper House and directly for the fatal spot upon which stood Mr. Eaton's residence.

The spreading out of the waters over the very extensive area north of the town must have greatly retarded the rapid progress of the flood and caused the flow through the town to be comparatively slow, and hence much less destructive than it would have been had it been confined to a narrow channel.

The flood which filled the Monument bed was probably due to similar conditions upon areas other than those above described. Large stretches north and northeast of the fair grounds empty their quotas into it.

The observer on the summit of Pike's Peak, Colorado, notes the following in his daily journal:

On the morning of the 26th Colorado Springs appeared as though the town had been visited by a "water-spout" or "cloud-burst." Upon closer examination with the telescope there were observed, about two miles to the northeast of the city, great banks of sleet, from which were flowing large streams of water; immense pools of water appeared in all the principal streets of the city and the first floors of many dwellings were wholly under water.

Baltimore, Maryland: a heavy rainfall occurred in this city on the afternoon of the 26th. In the lower part of the northwestern section of the city about thirty houses were flooded; in some instances the water covering the first floors.

Reading, Pennsylania: during the storm on the night of the 26–27th, two dams at Flying Hill Park gave way, and resulted in the loss of bridges, fencings, etc.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1885, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 84.62 per cent. The percentages for the four elements are: Weather, 83.63; direction of the wind, 84.89; temperature, 85.43; barometer, 82.78 per cent. By geographical districts, they are: For New England, 74.22; middle Atlantic states, 83.87; south Atlantic states, 85.93; eastern Gulf states, 89.75; western Gulf states, 87.86; lower lake region, 80.16; upper lake region, 84.16; Ohio valley and Tennessee, 84.41; upper Mississippi valley, 83.39; Missouri valley, 79.54; north Pacific coast region, 88.45; middle Pacific coast region, 92.11; south Pacific coast region, 95.47. There were four omissions to predict, out of 3,352, or 0.12 per cent. Of the 3,348 predictions that have been made, eighty-nine, or 2.66 per cent., are considered to have entirely failed; one hundred and fifty-nine, or 4.75 per cent., were one-fourth verified; three hundred and eighty-two, or 11.42 per cent., were one-half verified; four hundred and sixty, or 13.76 per cent., were three-fourths verified; 2,254, or 67.41 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Special predictions of the weather and temperature have also been made during the month each day for certain localities. The percentages of verifications of these special predictions as made by this office, and in some cases by the observers, are as follows:

Richmond, Virginia, 90.73; Meadville, Pennsylvania, beginning July 4th, 81.25 (as verified by observer, 72.30); Oil City, Pennsylvania, beginning on the 10th, 82.73 (as verified by observer, 100); Columbus, Ohio, 83.06 (as verified by the Ohio Meteorological Bureau, 82.0); Bucyrus, Ohio, beginning on the 2d, 83.75; Albany, New York, 80.64; Cincinnati, Ohio, 80.64; Buffalo, New York, 81.45; Indianapolis, Indiana, 82.26; Chicago, Illinois, 70.16; Saint Louis, Missouri, 74.19; Cairo, Illinois, beginning on the 26th, 83.33; Boston, Massachusetts, and New Haven, Connecticut, 79.03 (as verified by observer, 58.06); Louisville, Kentucky, 75.40; Detroit, Michigan, 79.84; Toledo, Ohio, 77.42; Milwaukee, Wisconsin, 65.32; Jacksonville, Florida, 66.13; Rochester and Oswego, New York, beginning on the 29th, 66.67; Auburn, Alabama, 95.50; Kansas, Indian Territory and western Missouri, 82.26; central Illinois and western Indiana, beginning on the 4th, 78.54; northwestern Ohio and eastern Indiana, beginning on the 4th, 83.48; Omaha, 65.74; Arkansas, 75.46; Georgia, 88.36; Washington, District of Columbia, and Baltimore, Maryland, 80.42; Colorado (for sixteen days), 75.00; New York and Philadelphia, 76.21; Tennessee, beginning on the 4th, 86.46; and Dallas, Texas, beginning on the 18th, 85.42 per cent (as verified by observer, 73.33).

NOTE.—The official "Indications" issued by the Signal Service, beginning with the month of July, 1885, are for a period of thirty-two hours, instead of twenty-four hours, as heretofore.

CAUTIONARY SIGNALS.

During July, 1885, sixty-four cautionary signals were ordered. Of these, thirty-eight, or 59.37 per cent., were justified by winds of twenty-five miles or more per hour, at or within one hundred miles of the station. Eleven cautionary off-shore signals were ordered, of which number, ten, or 91.11 per cent., were justified as to direction, but none were justified as to velocity. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Two signals were ordered late. In thirty eight cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in his report for July, states:

The verification of prediction for the whole area was 98 per cent. for temperature and 93 per cent. for weather.

The following roads comprise this system: Western, of Alabama; South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia; Memphis and Charleston; Columbus Western; Atlanta and West Point, of Georgia; Northeastern, of Georgia.

The July, 1885, report of the "Ohio Meteorological Bureau," under direction of Prof. B. F. Thomas, contains the following:

The verification of railway signals for the month was: for temperature, 91 per cent.; for weather, 73 per cent.